Original Article

Unwanted childbearing and household food insecurity in the United States

Shivani A. Patel[*][†] **and Pamela J. Surkan**[‡]

Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Johns Hopkins University, Baltimore, Maryland, USA, †Department of Global Health, Rollins School of Public Health, Emory University, Atlanta, Georgia, USA, and ‡Department of International Health, Johns Hopkins Bloomberg School of Public Health, Johns Hopkins University, Baltimore, Maryland, USA

Abstract

Household food insecurity is a population health concern disproportionately affecting families with children in the United States. Unwanted childbearing may place unanticipated strain on families to meet basic needs, heightening the risk for household food insecurity. We investigated the association between mother's and father's report of unwanted childbearing and exposure to household food insecurity among children residing in two-parent households in the United States. Data from the Early Childhood Longitudinal Study – Birth Cohort, a nationally representative cohort of US children ($n \sim 6150$), were used to estimate the odds of household food insecurity when children were aged 9 months and 2 years, separately, based on parental report of unwanted childbearing. The majority of children were reported as wanted by both parents (74.4%). Of the sample, report of unwanted childbearing by father-only was 20.0%, mother-only was 3.4% and joint mother and father was 2.2%. Household food insecurity was higher when children were 9 months compared with 2 years. In adjusted models accounting for confounders, children born to mothers and fathers who jointly reported unwanted childbearing were at higher odds of exposure to household food insecurity at 9 months [adjusted odds ratio (AOR) = 3.31; 95% confidence interval (CI): 1.97, 5.57] and 2 years (AOR = 2.52; 95% CI: 1.12, 5.68). In two-parent households, we found that children raised by parents reporting unwanted childbearing were more likely to be exposed to food insecurity and potentially related stressors. Further studies that prospectively measure wantedness before the child's birth will aid in confirming the direction of this association.

Keywords: child, child unwanted, food, food insecurity, unintended pregnancy.

Correspondence: Dr Shivani A. Patel, 1518 Clifton Road, Room 7051, Atlanta, GA 30322, USA. E-mail: s.a.patel@emory.edu

Introduction

Food insecurity, or uncertainty regarding having or acquiring adequate food for all household members to lead a healthy life, not only has the potential to directly affect the nutritional health of families, but also acts as a stressor impacting the mental health of caregivers (Wu & Schimmele 2005; Whitaker *et al.* 2006; Bronte-Tinkew *et al.* 2007; McCrory & McNally 2013). While relations are complex and new evidence continues to improve our understanding

(Perez-Escamilla 2013), previous studies suggest that residing in food-insecure households may place infants and children at greater risk for negative physical and developmental outcomes, including overweight, insecure attachment, slowed cognitive development, behavioural problems, emotional problems and poor social skills (Whitaker *et al.* 2006; Bronte-Tinkew *et al.* 2007; Zaslow *et al.* 2009; Belsky *et al.* 2010; Howard 2011; Melchior *et al.* 2012; Perez-Escamilla & de Toledo Vianna 2012). Although household income poverty is a principal risk factor for

food insecurity (Rose 1999; Cook & Frank 2008), not all poor families are food insecure. Identifying households most at risk for food insecurity has value for both prevention and intervention.

Household composition has been consistently associated with food insecurity in the United States (Alaimo *et al*. 1998; Coleman-Jensen *et al*. 2012). For example, food insecurity is more prevalent in households with children less than 18 years compared with those without children (21% vs. 12%, respectively) (Coleman-Jensen *et al*. 2012). Similarly, households with larger family size (Alaimo *et al*. 1998) and households that gained an additional household member in the past 8 months (Rose 1999) were more likely to report food insecurity in separate national surveys. Unintended births may make families more vulnerable to food insecurity through an unplanned increase in family size. Unintended births are the result of unintended pregnancies, which are themselves classified in the literature as unwanted pregnancies (occurring when no more children were wanted) or mistimed pregnancies (occurring at a different time than desired) (Santelli *et al*. 2003; D'Angelo *et al*. 2004). In the United States, the burden of unintended pregnancy is high. Half of pregnancies to women surveyed in a nationally representative study were described as unintended, and approximately one-third of unintended pregnancies result in birth (Finer & Zolna 2011). Unintended births may additionally exacerbate existing household-level risk factors by disrupting a woman's educational attainment, negatively impacting her mental health status, or affecting her employment status (Bitto *et al*. 1997; Barber *et al*. 1999; Schmiege 2005). For young single women, researchers have found that motherhood presents an unanticipated economic strain on households to meet the basic needs and has been a contributor to food insecurity (Bronars & Grogger 1994; Stevens 2010).

Life history theory holds that human reproductive choices are patterned by the desire to maximise child survival into adulthood (MacDonald 1997). Life history theory suggests that men and women will strive to time marriage and select partners to best invest in successfully raising children. For example, in times of economic hardship, marriage may be delayed until it is financially feasible to raise a family (MacDonald 1997). Examined through the lens of life history theory, couples may determine their ideal family size based on their capacity to invest in their children. Additional children beyond the ideal number may strain household resources and may be reported as unwanted. Globally, there exists empirical support that there may be a trade-off between family size and child survival (Strassmann & Gillespie 2002; Lawson *et al*. 2012).

Births resulting from unwanted pregnancies, or unwanted childbearing, lead to a larger-than-desired family potentially compromising a couple's ability to optimally invest in their family. In this study, we investigated the hypothesis that unwanted childbearing negatively affects household food insecurity using a nationally representative sample of US children born in two-parent households. Because both mothers' and fathers' pregnancy desires may influence outcomes following an unwanted pregnancy, we examined wantedness reports from mothers and fathers individually and in combination. We restricted the analysis to two-parent households because the effect of unwanted childbearing on household outcomes may be different in the context of non-resident fathers.

Materials and methods

Study design and sample

The sample was drawn from the Early Childhood Longitudinal Study – Birth cohort (ECLS-B), a study

---

Key messages

- Unwanted childbearing may place strain on caregivers, and thus affect child health and well-being.
- Unwanted childbearing was associated with household food insecurity.
- Children reported as unwanted by both mother and father, compared with wanted by both, were at the highest odds of food insecurity.

---

sponsored by the National Center for Education Statistics. A nationally representative sample of approximately 10 700 infants born in the United States was enrolled in the ECLS-B in 2001 and prospectively followed until entry into kindergarten in 2007 (Snow *et al*. 2009). Information regarding early cognitive, social, motor and physical development among children was collected. The first parent interview occurred when infants were aged 9 months. The ECLS-B excluded infants born to mothers younger than 15 years old, and infants who had been adopted or died before 9 months. The current study is based on data from the first two study waves of the ECLS-B, when children were ages 9 months and 2 years, collected through interviews of mothers and separate self-administered questionnaires of each parent (detailed in the succeeding paragraphs). We restricted our sample to children who resided with their biological mother and father because of the fact that we were conceptually interested in concordance and discordance of wantedness of couples. Because of the National Center for Education Statistics data use requirements, all reported unweighted frequencies must be rounded to the nearest 50. The final baseline analytic sample includes $n = \sim 6150$ children (after imputation of missing variables; discussed in the succeeding paragraphs) whose parents responded to the self-administered questionnaire at 9 months. Due to attrition at follow-up, fewer children ($n = \sim 4650$) were available for analysis at the 2-year wave.

The ECLS-B obtained necessary approval from state and other institutional review boards to conduct data collection activities. Parents provided informed consent at the time of interview. The present study was a secondary data analysis of de-identified data and was approved for dissemination by the Institute of Education Statistics Data Security Office.

Household food insecurity

The primary outcome of interest was a measure of household food insecurity collected through a computer-assisted personal interview with mothers at the 9-month (2001–2002) and 2-year (2003–2004) waves. Food insecurity was measured using an 18-item scale developed by the Food and Nutrition Service of the US Department of Agriculture in 2000 (Bickel *et al*. 2000). The scale included items such as whether the respondent agreed that she 'worried whether our food would run out before we got money to buy more' and 'did you ever eat less than you felt you should because there wasn't enough money to buy food?' Based on scale responses (Bickel *et al*. 2000; Snow *et al*. 2009), standard benchmarks used at the time when data were collected were used to categorise households as having 'food security' (minimal indication of food insecurity), 'low food security' (concerns about meeting needs, reduced quality of food; formerly called 'food insecure without hunger') and 'very low food security' (food intake has been reduced for adults and in some cases among children; formerly called 'food insecure with hunger'). We defined 'household food insecurity' as those having low or very low food security. Lack of household food insecurity was the reference status.

Unwanted childbearing

We defined 'unwanted childbearing' as a child resulting from a pregnancy that occurred when the parent reported wanting no more children. The questions and procedures utilised were typical of fertility surveys regarding pregnancy intentions (Campbell & Mosher 2000). These data were collected retrospectively 9 months after the child had been born. Because of the potentially sensitive nature of these questions, pregnancy wantedness was asked through self-administered paper questionnaires. Mothers and resident fathers were separately given questionnaires to complete during the interviewer visit. Mothers were asked the question 'At the time you became pregnant with your baby, did you yourself actually want to have a baby at some time?' and fathers were asked 'At the time your spouse/partner became pregnant with the child, did you want her to have a(nother) baby at some time?' A response of 'no' was indicative of unwanted childbearing based on our definition. A four-level categorical composite variable was created to classify the wantedness of another child: (1) both mother and father wanted to have another baby at some time (reference); (2) the mother did not want another baby but the father did; (3) the mother did

want another baby, but the father did not; or (4) neither wanted another baby. This variable classified pregnancies that were mistimed (earlier or later than desired) as 'wanted'.

Covariates

Several factors that may jointly influence pregnancy intention and food insecurity were examined. Relevant household characteristics included household income, home ownership and the number of children under the age of 18 in the household. Income and home ownership may reflect economic capacity, while the number of children in the household may reflect economic demands. Parental characteristics included maternal and paternal age and employment status, marital status and highest level of education attained between them. Parental age, marital status, employment and education are each associated with both pregnancy intentions and food insecurity. Child race (a composite of mother's and father's race classified based on maternal report), child sex and birth plurality were also considered as potential confounders. Race is a key socioeconomic dimension and the birth of more than one child at a single pregnancy is effectively an unanticipated increase in family size.

Statistical analysis

The ECLS-B employed a longitudinal, multistage stratified cluster sampling strategy. All descriptive and regression analyses, conducted in 2012–2013, were weighted to account for unequal sampling probabilities, survey non-response and differential attrition at the second wave. Unweighted frequencies, rounded to the nearest 50, were reported to convey the sample size of individuals with complete covariate data contributing to the analyses. We examined sample characteristics at the 9-month wave stratified by category of unwanted childbearing and conducted tests for differences between groups.

Approximately 8% of mothers and 2% of fathers in the eligible study population were missing data on unwanted childbearing; each of the other variables were missing for less than 2% of respondents. A complete case-analysis would have assumed that parents with incomplete responses did not differ from those with complete responses (Stuart *et al.* 2009). To minimise bias from making this assumption, we imputed missing responses using a method designed for large survey data sources such as the ECLS-B (Raghunathan *et al.* 2001). Ten imputed datasets were generated through multiple imputation by chained equations using the IVEware package for SAS (Raghunathan *et al.* 2001). We included all independent and dependent variables at 9 months, as well as maternal smoking, child birthweight, maternal education and whether the child had ever been breastfed, in the imputation model. The results from each imputed dataset were combined used standard methods (Berglund 2010).

We conducted a design-based analysis using logistic regression to model the relative odds of food insecurity when children were 9 months and 2 years, separately, based on unwanted childbearing reported at 9 months using the multiply imputed data. To account for clustering in the sample design, the Taylor Series linearisation method was used for variance estimation. These models were then adjusted for covariates that significantly differed by unwanted childbearing at the 9-month wave. Covariate data were taken from the 9-month wave of data collection because changes at 24 months may have been on the causal pathway between unwanted childbearing and food insecurity. Nonetheless, most factors were stable through the two waves and results were not affected by using covariate data from the 24-month wave in those models. Both descriptive and regression analyses were conducted using SAS 9.3 Software (SAS Institute Inc., Cary, NC, USA).

Results

The observed sample with complete data (prior to multiple imputation) consisted of 5600 children born in 2001, who were non-Hispanic White (61.9%), Hispanic (23.5%), non-Hispanic Black (7.3%), Asian (4.4%) and Native American (2.9%) (See Table 1). Fifty-two percent were male, and the majority were singletons (97.1%). At 9 months, over a third of children were the only household members under 18 years of age and most were born to mothers and

Table 1. Distribution of sample sociodemographic characteristics by unwanted childbearing reported 9 months after birth*

		Overall[†]	Retrospectively reported wantedness of another child at the time of pregnancy[‡]				P[§]
			Both wanted $n = 4050$	Mother did not want $n = 200$	Father did not want $n = 1250$	Neither wanted $n = 150$	
		%	%	%	%	%	
Household characteristics							
Household income	<$25 000	24.8	65.8	4.8	25.9	3.5	<0.01
	$25 000–$49 000	31.1	74.0	4.6	19.3	2.1	
	≥$50 000	44.1	79.5	1.8	17.2	1.5	
Home ownership	Does not own home	41.3	70.0	5.4	21.8	2.7	<0.01
	Owns home	58.7	77.5	2.0	18.8	1.8	
Household members <18 years	1	35.4	79.3	2.3	17.4	1.0	<0.01
	2	35.9	76.5	2.2	19.8	1.4	
	3 or more	28.7	65.7	6.2	23.5	4.6	
Parental characteristics							
Maternal age	<19	1.9	54.5	7.5	36.8	1.2	<0.01
	20–24	20.3	69.9	5.3	22.4	2.5	
	25–29	28.7	79.5	2.5	16.2	1.8	
	30–34	29.6	75.7	3.4	19.2	1.6	
	35 or older	19.6	72.8	2.1	21.9	3.2	
Maternal employment	Employed	53.4	74.0	2.7	20.9	2.4	0.02
	Unemployed	5.4	68.5	3.2	25.1	3.1	
	Not in labour force[¶]	41.2	75.7	4.3	18.2	1.8	
Paternal age	<19	0.5	56.2	0.0	41.5	2.3	
	20–24	13.4	71.2	5.1	20.9	2.8	
	25–29	24.2	74.3	3.8	20.0	1.8	
	30–34	30.9	77.9	2.9	16.8	2.4	
	35 or older	31.0	73.5	2.6	22.0	1.9	
Parents are married	No	16.0	61.6	4.5	30.1	3.8	<.01
	Yes	84.0	76.9	3.2	18.1	1.9	
Paternal employment	Employed	92.8	75.3	3.3	19.4	2.1	0.03
	Unemployed	3.7	62.2	5.6	30.1	2.1	
	Not in labour force[¶]	3.5	66.5	4.8	24.7	4.0	
Highest parental education	Some high school or less	7.2	61.6	5.1	29.5	3.8	<0.01
	High school/Technical	25.2	69.0	4.6	23.6	2.9	
	Some college	28.0	73.1	4.3	20.2	2.4	
	College graduate or beyond	39.6	81.1	1.7	16.0	1.2	
Maternal smoking	No	83.5	75.3	3.1	19.6	1.9	0.02
	Yes	16.5	69.9	4.6	22.2	3.3	
Child characteristics							
Race	White	61.9	78.5	2.4	17.5	1.5	<0.01
	Black	7.3	51.6	8.8	31.8	7.8	
	Hispanic	23.5	73.0	3.6	21.6	1.7	
	Asian	2.9	62.1	2.1	32.7	3.0	
	Other	4.4	69.5	7.3	19.7	3.5	
Sex	Male	51.6	75.0	3.0	19.8	2.2	0.59
	Female	48.4	73.8	3.8	20.2	2.1	
Singleton	No	2.9	70.0	1.7	25.8	2.6	<0.01
	Yes	97.1	74.6	3.4	19.9	2.2	

Table 1. Continued

		Overall[†]	Retrospectively reported wantedness of another child at the time of pregnancy[‡]				P[§]
			Both wanted $n = 4050$	Mother did not want $n = 200$	Father did not want $n = 1250$	Neither wanted $n = 150$	
		%	%	%	%	%	
Outcomes							
Household food	No	90.8	75.3	3.1	19.9	1.7	<0.01
insecurity at 9 months	Yes	9.2	65.4	6.7	21.5	6.4	
Household food	No	93.5	75.6	2.9	19.6	1.9	<0.01
insecurity at 2 years	Yes	6.5	59.4	7.6	26.4	6.6	

*Sample characteristics prior to imputation based on a total of $n = 5600$ (wantedness categories sum to $n = 5650$ due to rounding to the nearest 50). [†]Weighted column percent is shown. [‡]Reported sample sizes for each unwanted childbearing category are unweighted and rounded to the nearest 50 per Institute of Education Statistics requirements; weighted row percent is shown. [§]P-values for difference in characteristics by unwanted childbearing category based on the Rao-Scott F-statistic, accounting for the sampling design. [¶]Not employed and not actively looking for employment.

fathers aged 20 years or older; 83.5% of parents were married. Most fathers were employed (92.8%), while just over half of mothers were employed. Roughly 40% of children had at least one parent with a college education.

The majority of children were reported as wanted by both parents (74.4%). Father-only report of unwanted childbearing (20.0%) was more common than mother-only report (3.4%). A total of 2.2% of children were reported to be unwanted by both parents. Nearly all of the examined background characteristics of households, parents and children were statistically significantly associated with child wantedness status. Children reported as unwanted by both mothers and fathers were more likely to be residing in households in which the annual income was less than $25 000, the parents did not own their homes, there were three or more children under the age of 18, mothers were unemployed, fathers were not in the labour force, parents achieved a high school education or less and the children were black.

The prevalence of household food insecurity was 9.2% at 9 month and 6.5% at 2 years (Table 1). Across the two waves of follow-up, 8.2% reported food insecurity at 9 months only, 4.9% reported food

insecurity at 2 years only and 4.3% of households reported food insecurity at both waves. Figure 1 displays the observed prevalence of food insecurity by category of unwanted childbearing weighted for the sample. The prevalence of food insecurity at the 9-month and 2-year waves was highest among households in which both parents reported the index child as unwanted; it was next highest in households in which mothers alone reported the child to be unwanted, followed by households in which fathers alone reported the child as unwanted and lowest among households in which both parents reported wanting the child.

Unwanted childbearing and food insecurity

In unadjusted models, mother-only and joint mother- and father- report of unwanted childbearing was associated with food insecurity at the 9-month and 2-year waves (Table 2). In adjusted models, unwanted childbearing by both parents was statistically significantly associated with household food insecurity at the 9-month [adjusted odds ratio (AOR) = 3.31; 95% confidence interval (CI): 1.97, 5.57]. We observed a similar pattern at the 2-year wave, in which only
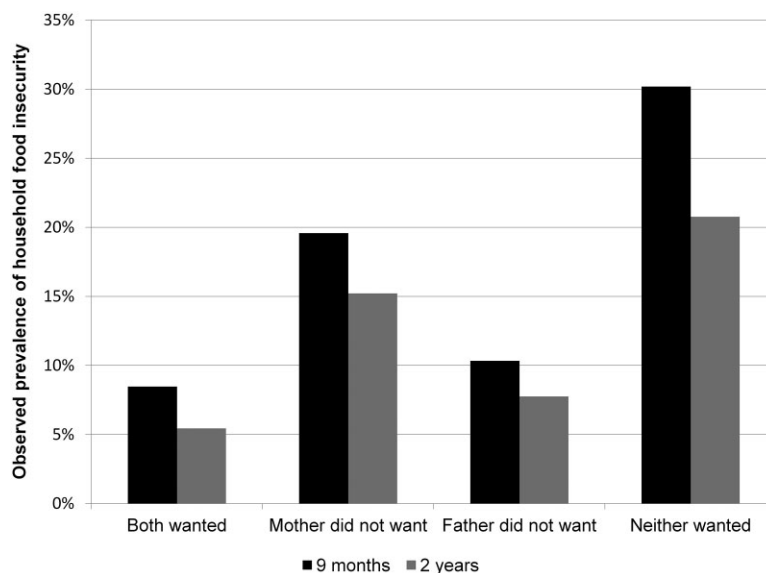
Fig. 1. Prevalence of food insecurity by unwanted child bearing at each survey wave.

Table 2. Unadjusted and adjusted logistic regression models[†] of the association between unwanted childbearing[‡] and food insecurity at each survey wave

Time period at outcome	Wantedness of another child[‡]	Unadjusted associations			Adjusted[§] associations		
		OR	95% CI		OR	95% CI	
	Both wanted another child	1.00			1.00		
9 months	Mother did not want	2.62**	1.48	4.66	1.55	0.79	3.03
(n = 6150)	Father did not want	1.25	0.94	1.66	0.96	0.69	1.34
	Neither wanted	4.68**	2.91	7.50	3.31**	1.97	5.57
	Both wanted another child	1.00			1.00		
2 years	Mother did not want	3.12**	1.48	6.57	1.89	0.79	4.53
(n = 4650)	Father did not want	1.46	0.96	2.22	1.18	0.73	1.90
	Neither wanted	4.54**	2.04	10.11	2.52*	1.12	5.68

CI, confidence interval; OR, odds ratio. *$P < 0.05$; **$P < 0.01$. [†]Sample size and analysis based on multiply imputed data; design-based estimation using logistic regression model. Restricting the analysis to data from observed complete cases yielded similar results. [‡]Whether each parent wanted more children when the mother became pregnant, retrospectively reported when the child was 9 months. [§]Adjusted for: household income, home ownership and the number of children under the age of 18 in the household, maternal age, paternal age, marital status of parents, maternal employment status, paternal employment status and highest level of parental education, whether the index birth was a singleton and child race (composite of mother's and father's race).

unwanted childbearing by both parents was associated with household food insecurity (AOR = 2.52; 95% CI:1.12, 5.68).

Discussion

This study provides preliminary evidence that there is a relation between unwanted childbearing and household food insecurity among two-parent families in the United States. Children born to parents who jointly reported unwanted childbearing, compared with those whose parents did not report unwanted childbearing, were more likely to be exposed to household food insecurity in the first 2 years of life, independent of other confounding factors. Neither maternal-only nor paternal-only unwanted childbearing were associated with food insecurity after adjustment for potential confounders. We also observed that

household food insecurity was more common at 9 months after the child was born compared with 2 years later, suggesting that the post-birth period may be a vulnerable time for food insecurity for families.

The pathway linking unwanted childbearing and household food insecurity may be through exceeding parental capacity to support the family. Unwanted childbearing, by definition, leads to a family size larger than what was originally desired. Our findings are consistent with expectations based on life history theory: households that reported unwanted childbearing may be compromised in their ability to invest in their children because of resource limitations, as reflected in household food insecurity. Previous cross-national research found that nutritional status of children worsened with increasing family size and that this association was more pronounced for children of parents who reported unwanted childbearing in approximately 25% of 15 developing countries studied (Desai 1995). Unwanted pregnancy, the antecedent to unwanted childbearing, may be more amenable to intervention than other household and structural determinants of household food insecurity, such as financial management skills, mental health, minority status, employment status, transportation and food accessibility and pricing (Heflin *et al.* 2007; Gorton *et al.* 2010; Dean & Sharkey 2011; Gundersen & Garasky 2012; Hadley & Crooks 2012).

Family health may be influenced by both mothers' and fathers' fertility intentions. Mothers' and fathers' reports of unwanted childbearing differed in this study. Fathers were more likely to report unwanted childbearing than mothers, and overall the prevalence of jointly reported unwanted childbearing was low (2.2%). As shown in Fig. 1, the observed prevalence of food insecurity is higher for all categories of unwanted childbearing compared with wanted childbearing at both survey waves. Although mothers were less likely to report a child as unwanted, households in which mothers reported unwanted childbearing were more likely to experience food insecurity. Perhaps this is not surprising given that mothers reported food insecurity for the household, and there may be a bidirectional association between unwanted childbearing and food insecurity such that food insecurity and resource stress experienced after the

birth of a child prompted mothers to report a wanted pregnancy as unwanted after birth. The discrepant reports of unwanted childbearing may reflect parents' divergent views on family size or the family's ability to invest in another child. The positive, independent association between jointly reported unwanted childbearing and food insecurity, in contrast to the null association between mother's-only or father's-only report of unwanted childbearing and food insecurity, may be due to higher validity of the joint-report in reflecting the family's incapacity to invest in another child.

This study had several strengths. Findings were based on a panel of large, representative sample of children in the United States providing robust estimates and wide generalisability. We utilised a measure of unwanted childbearing based on the desires of both parents, providing insight into the differential consequences of maternal vs. paternal unwanted childbearing, along with the consequences because of joint unwanted childbearing. As such, we examined unwanted childbearing among two-parent households, a largely unexplored population in the literature relating health outcomes to pregnancy intentions. Married-couple households are the least vulnerable to food insecurity (Coleman-Jensen *et al.* 2012) and married women are less likely to report any kind of unintended pregnancy (Finer & Henshaw 2006). The heightened longitudinal odds of household food insecurity among children residing in two-parent households speaks to the strain that unwanted childbearing may place on families.

The retrospective report of whether the index child was wanted at birth is a limitation of this study. We were not able to distinguish temporal order of unwanted childbearing and food insecurity as a result. Although we hypothesised that unwanted childbearing increased the risk of household food insecurity, it may be that food insecurity or other related stressors lead to reporting a child as unwanted. Previous studies, however, indicate that parents may sublimate negative feelings towards an unwanted child by reporting it as wanted after birth (Gipson *et al.* 2008). In an effort to minimise bias because of the retrospective self-reporting of child wantedness, data were collected separately for mothers and fathers using

self-reported questionnaires, reducing social desirability bias and allowing more opportunity to capture unwanted childbearing from at least one parent. Non-differential underreport of unwanted childbearing would likely result in a bias towards the null. Report of unwanted childbearing was missing for 8% of mothers; we used multiple imputation to minimise any resulting bias. There was also substantial attrition over time. We used survey weights in all regression models to address the possibility of bias because of differential attrition. This was an observational study, and households classified as reporting any type of unwanted childbearing differed from those that did not. To mitigate this, we adjusted for several household and parental characteristics that previously have been found to be related to both unwanted childbearing and food insecurity, such as household income, household composition and educational background. In doing so, however, we may have in fact controlled for mediating pathways, resulting in overly conservative estimates of the association of interest. Finally, we note that we studied household-level food insecurity, which should not be interpreted as child-specific hunger or food insufficiency; rather, it describes a household environment in which adults and/or children are food insecure.

Reducing both unintended fertility and food insecurity have long been public health priorities in the United States. Our findings posit a potentially important role for addressing and identifying unwanted childbearing, a consequence of unintended fertility, alongside other population-level interventions attempting to improve food security among households with children nationally (Black 2012). Given the evidence of impact of unwanted pregnancy on breastfeeding duration (Chinebuah & Pérez-Escamilla 2001; Hromi-Fiedler & Pérez-Escamilla 2006), if our findings are confirmed in further research, there could be a compounded adverse effect on children both through food insecurity and earlier breastfeeding cessation among children from unwanted pregnancies. Further research on unwanted pregnancy among two-parent households is needed to determine whether this population deserves specific outreach from policy interventions known to successfully reduce food insecurity and mitigate its consequences (Black *et al.* 2012). Similarly, fathers' fertility intentions may be an important, but relatively ignored, component of food insecurity. This study provides early evidence that aligning the agenda of family planning and food assistance programmes may provide synergistic opportunities to improve family health domestically.

Source of funding

Conflicts of interest

Contributions

SAP and PJS jointly conceived of the study and drafted the manuscript. SAP performed statistical analyses.

References

Alaimo K., Briefel R.R., Frongillo E.A. & Olson C.M. (1998) Food insufficiency exists in the United States: results from the third National Health and Nutrition Examination Survey (NHANES III). *American Journal of Public Health* **88** (3), 419–426.

Barber J.S., Axinn W.G. & Thornton A. (1999) Unwanted childbearing, health, and mother-child relationships. *Journal of Health and Social Behavior* **40** (3), 231–257.

Belsky D.W., Moffitt T.E., Arseneault L., Melchior M. & Caspi A. (2010) Context and sequelae of food insecurity in children's development. *American Journal of Epidemiology* **172**, 809–818.

Berglund P. (2010) An introduction to multiple imputation of complex sample data using SAS® v9.2. *SAS Global Forum 2010*. Paper 265–2010.

Bickel G., Nord M., Price C., Hamilton W. & Cook J. (2000) Guide to measuring household food security, revised 2000. U.S. Department of Agriculture, Food and Nutrition Service, Alexandria VA. March, 2000.

Bitto A., Gray R.H., Simpson J.L., Queenan J.T., Kambic R.T., Perez A. *et al.* (1997) Adverse outcomes of planned

and unplanned pregnancies among users of natural family planning: a prospective study. *American Journal of Public Health* **87** (3), 338–343.

Black M. (2012) Protect children from household food insecurity: promote access to food and stress-alleviating resources. *Journal of Applied Research on Children: Informing Policy for Children at Risk* **3** (1), 1–5. Available at: http://digitalcommons.library.tmc.edu/childrenatrisk/vol3/iss1/18

Black M.M., Quigg A.M., Cook J., Casey P.H., Cutts D.B., Chilton M. *et al.* (2012) WIC participation and attenuation of stress-related child health risks of household food insecurity and caregiver depressive symptoms. *Archives of Pediatrics & Adolescent Medicine* **166** (5), 444–451.

Bronars S.G. & Grogger J. (1994) The economic consequences of unwed motherhood: using twin births as a natural experiment. *The American Economic Review* **84** (5), 1141–1156.

Bronte-Tinkew J., Zaslow M., Capps R., Horowitz A. & McNamara M. (2007) Food insecurity works through depression, parenting, and infant feeding to influence overweight and health in toddlers. *The Journal of Nutrition* **137** (9), 2160–2165.

Campbell A.A. & Mosher W.D. (2000) A history of the measurement of unintended pregnancies and births. *Maternal and Child Health Journal* **4** (3), 163–169.

Chinebuah B. & Pérez-Escamilla R. (2001) Unplanned pregnancies are associated with less likelihood of prolonged breast-feeding among primiparous women in Ghana. *The Journal of Nutrition* **131** (4), 1247–1249.

Coleman-Jensen A., Nord M., Andrews M. & Carlson S. (2012) *Household Food Security in the United States in 2011*. U.S. Department of Agriculture, Economic Research Service.

Cook J.T. & Frank D.A. (2008) Food security, poverty, and human development in the United States. *Annals of the New York Academy of Sciences* **1136**, 193–209.

D'Angelo D.V., Gilbert B.C., Rochat R.W., Santelli J.S. & Herold J.M. (2004) Differences between mistimed and unwanted pregnancies among women who have live births. *Perspectives on Sexual and Reproductive Health* **36** (5), 192–197.

Dean W.R. & Sharkey J.R. (2011) Food insecurity, social capital and perceived personal disparity in a predominantly rural region of Texas: an individual-level analysis. *Social Science & Medicine* **72** (9), 1454–1462.

Desai S. (1995) When are children from large families disadvantaged? Evidence from cross-national analyses. *Population Studies* **49** (2), 195–210.

Finer L.B. & Henshaw S.K. (2006) Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. *Perspectives on Sexual and Reproductive Health* **38** (2), 90–96.

Finer L.B. & Zolna M.R. (2011) Unintended pregnancy in the United States: incidence and disparities, 2006. *Contraception* **84** (5), 478–485.

Gipson J.D., Koenig M.A. & Hindin M.J. (2008) The effects of unintended pregnancy on infant, child, and parental health: a review of the literature. *Studies in Family Planning* **39** (1), 18–38.

Gorton D., Bullen C.R. & Mhurchu C.N. (2010) Environmental influences on food security in high-income countries. *Nutrition Reviews* **68** (1), 1–29.

Gundersen C.G. & Garasky S.B. (2012) Financial management skills are associated with food insecurity in a sample of households with children in the United States. *The Journal of Nutrition* **142** (10), 1865–1870.

Hadley C. & Crooks D.L. (2012) Coping and the biosocial consequences of food insecurity in the 21st century. *American Journal of Physical Anthropology* **149** (S55), 72–94.

Heflin C.M., Corcoran M.E. & Siefert K.A. (2007) Work trajectories, income changes, and food insufficiency in a michigan welfare population. *The Social Service Review* **81** (1), 3–25.

Howard L.L. (2011) Transitions between food insecurity and food security predict children's social skill development during elementary school. *The British Journal of Nutrition* **1–10**.

Hromi-Fiedler A.J. & Pérez-Escamilla R. (2006) Unintended pregnancies are associated with less likelihood of prolonged breast-feeding: an analysis of 18 Demographic and Health Surveys. *Public Health Nutrition* **9** (3), 306–312.

Lawson D.W., Alvergne A. & Gibson M.A. (2012) The life-history trade-off between fertility and child survival. *Proceedings of the Royal Society B: Biological Sciences* **279** (1748), 4755–4764.

MacDonald K. (1997) Life history theory and human reproductive behavior. *Human Nature* **8** (4), 327–359.

McCrory C. & McNally S. (2013) The effect of pregnancy intention on maternal prenatal behaviours and parent and child health: results of an Irish cohort study. *Paediatric and Perinatal Epidemiology* **27** (2), 208–215.

Melchior M., Chastang J.-F., Falissard B., Galéra C., Tremblay R.E., Côté S.M. *et al.* (2012) Food insecurity and children's mental health: a prospective birth cohort study. *PLoS ONE* **7** (12), e52615.

Perez-Escamilla R. (2013) Food insecurity in children: impact on physical, psychoemotional and social development. In: *Modern Nutrition in Health and Disease*, pp. 1006–1015. Lippincott Williams & Wilkins: Baltimore, MD.

Perez-Escamilla R. & de Toledo Vianna R.P. (2012) Food insecurity and the behavioral and intellectual development of children: a review of the evidence. *Journal of*

Applied Research on Children: Informing Policy for Children at Risk **3** (1), 1–16. Available at: http://digitalcommons.library.tmc.edu/childrenatrisk/vol3/iss1/9

Raghunathan T., Lepkowski J., VanHoewyk J. & Solenberger P. (2001) A multivariate technique for multiply imputing missing values using a sequence of regression models. *Survey Methodology* **27** (1), 85–95.

Rose D. (1999) Economic determinants and dietary consequences of food insecurity in the United States. *The Journal of Nutrition* **129** (2), 517S–520S.

Santelli J., Rochat R., Hatfield-Timajchy K., Gilbert B.C., Curtis K., Cabral R. *et al*. (2003) The measurement and meaning of unintended pregnancy. *Perspectives on Sexual and Reproductive Health* **35** (2), 94–101.

Schmiege S. (2005) Depression and unwanted first pregnancy: longitudinal cohort study. *BMJ (Clinical Research Ed.)* **331** (7528), 1303.

Snow K., Derecho A., Wheeless S., Lennon J., Rosen J., Rogers J. *et al*. (2009) Early childhood longitudinal study, birth cohort (ECLS-B), kindergarten 2006 and 2007 data file user's manual (2010-010). Washington, DC: National Center for Education Statistics.

Stevens C.A. (2010) Exploring food insecurity among young mothers (15–24 years). *Journal for Specialists in Pediatric Nursing* **15** (2), 163–171.

Strassmann B.I. & Gillespie B. (2002) Life-history theory, fertility and reproductive success in humans. *Proceedings of the Royal Society of London. Series B: Biological Sciences* **269** (1491), 553–562.

Stuart E.A., Azur M., Frangakis C. & Leaf P. (2009) Multiple imputation with large data sets: a case study of the children's mental health initiative. *American Journal of Epidemiology* **169** (9), 1133–1139.

Whitaker R.C., Phillips S.M. & Orzol S.M. (2006) Food insecurity and the risks of depression and anxiety in mothers and behavior problems in their preschool-aged children. *Pediatrics* **118** (3), e859–e868.

Wu Z. & Schimmele C.M. (2005) Food insufficiency and depression. *Sociological Perspectives* **48** (4), 481–504.

Zaslow M., Bronte-Tinkew J., Capps R., Horowitz A., Moore K.A. & Weinstein D. (2009) Food security during infancy: implications for attachment and mental proficiency in toddlerhood. *Maternal and Child Health Journal* **13** (1), 66–80.